

— For easy measurements of work function and ionization potential —

Photoemission Yield Spectroscopy in Air (PYSA)



Lineup features a new compact model with the same ease-of-use and two Pro models incorporating frequently requested functions!

AC-2S Series

AC-2S / AC-2S Pro α / AC-2S Pro β

CE Marking (pending)
UL (pending)

RIKEN KEIKI Co., Ltd.

More compact while retaining same ease-of-use!
Three new models, including basic type and
pro-use types!

AC-2S Series

AC-2S / AC-2S Pro α / AC-2S Pro β



The AC-2S Series comprises three types:

For general analysis

AC-2S

Basic model featuring reduced size and weight that retains the same all-round functionality. Offers improved ease of use with new multi-point measurement and repeated measurement functions.

For materials development

AC-2S Pro α

Capable of high sensitivity, high resolution measurements for low work function materials and localized levels within band gaps. Also capable of high-temperature and film thickness measurement.

For device development

AC-2S Pro β

Capable of micro spot work function measurements—for example, for microscopic pattern processed locations. Also capable of high-temperature and film thickness measurement.

AC-2S Series Features

■ Refined ease-of-use

Completely updated measurement and analysis software for improved ease-of-use. (Also supports AC-2/AC-3/AC-5 data importing and analysis.)

■ Improved work efficiency with multi-point measurement function

Capable of multi-point measurements for up to 4 points. Helps improve work efficiency.

■ Repeated measurement function

Features newly-added repeated measurement function to reduce operator workloads.

■ Compact and lightweight

Significantly smaller dimensions compared to previous models (21 % reduced width, 38 % reduced weight)

* Comparison of AC-2S against previous model (Pro models differ.)

Inspiration, Innovation, Evolution

The AC Series is used widely in universities and research facilities around the world.

Above 2,000 related articles have been published on scientific journals.

Now we've added new features to meet the needs of researchers, for further ease-of-use refinements.

The AC-2S Series will create new value for users and around the world.

What is the AC Series?

Allows easy measurement of work function and ionization potential in air

(Measurement time: approx. 5 mins*)

Eliminates need for vacuum; samples can be easily inserted and removed, reducing measurement time.

* Measuring conditions: Measurement energy scanning range 4.2 - 6.2 eV, 0.1 eV steps, with 5 s count time per step

Measurements with high repeatability

Detects minute photoemission levels by subjecting samples to low intensity UV radiation. This minimizes damage to samples and assures high measurement repeatability.

AC Series Measuring Principle

Ultraviolet light emitted from a UV lamp undergoes wavelength (energy) selection in a spectrometer before being focused on the surface of a sample placed on the sample stage. An open counter (electron counting device) counts electrons discharged by the photoelectric effect (phenomenon in which electrons are discharged from material surface when the material absorbs light). The wavelength λ of the ultraviolet light is converted into light energy E by the following equation:

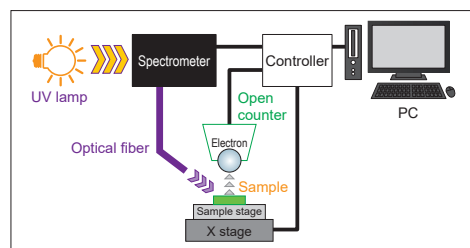
$$E = h\nu = h \cdot c / \lambda$$

(h : Planck constant, ν : frequency of light, c : speed of light, λ : wavelength)

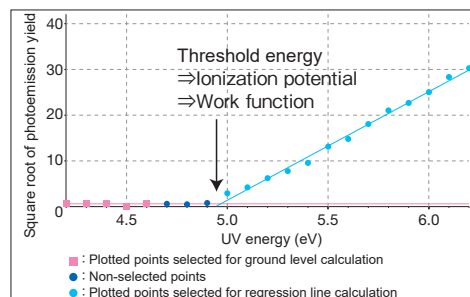
Increasing UV energy makes it possible to obtain the photoemission threshold energy (work function*¹ and ionization potential*²) as shown on the measurement application screen to the right.

*¹ Photoemission threshold energy for metals

*² Photoemission threshold energy for semiconductors



System configuration diagram



Measurement application screen



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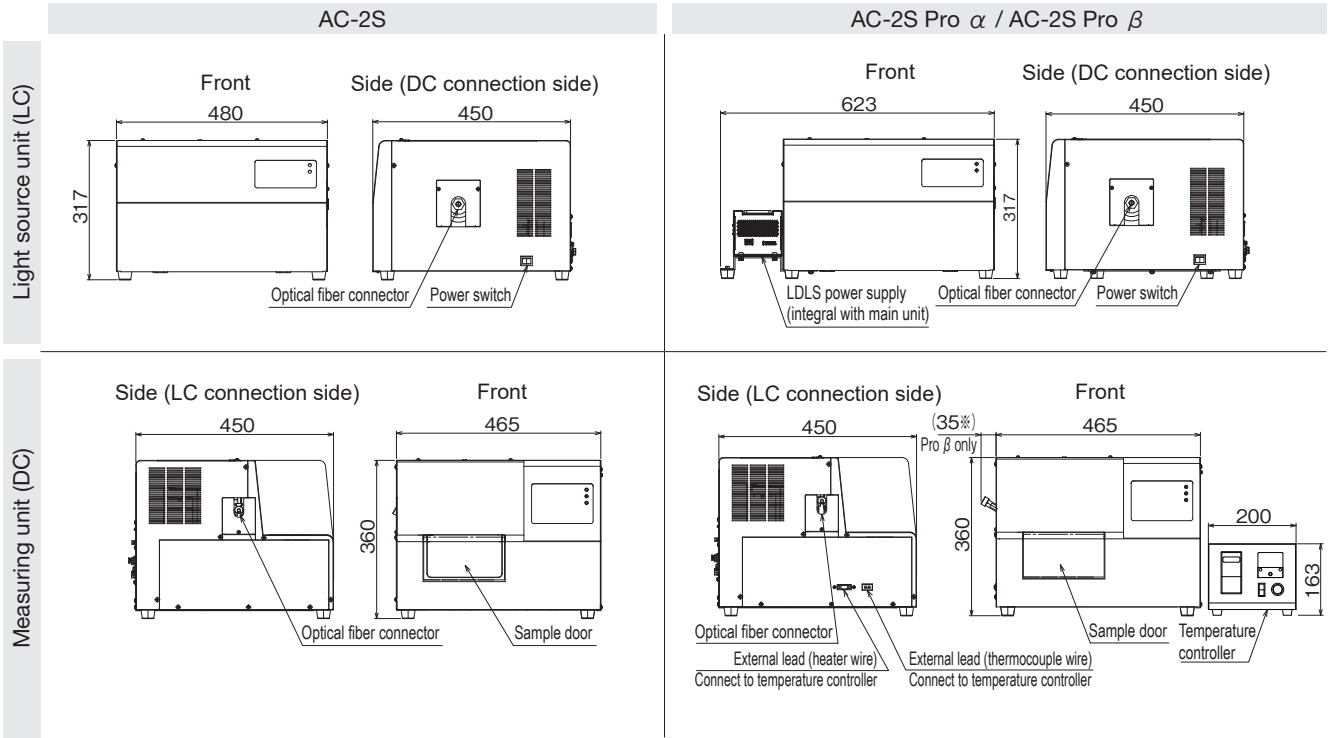


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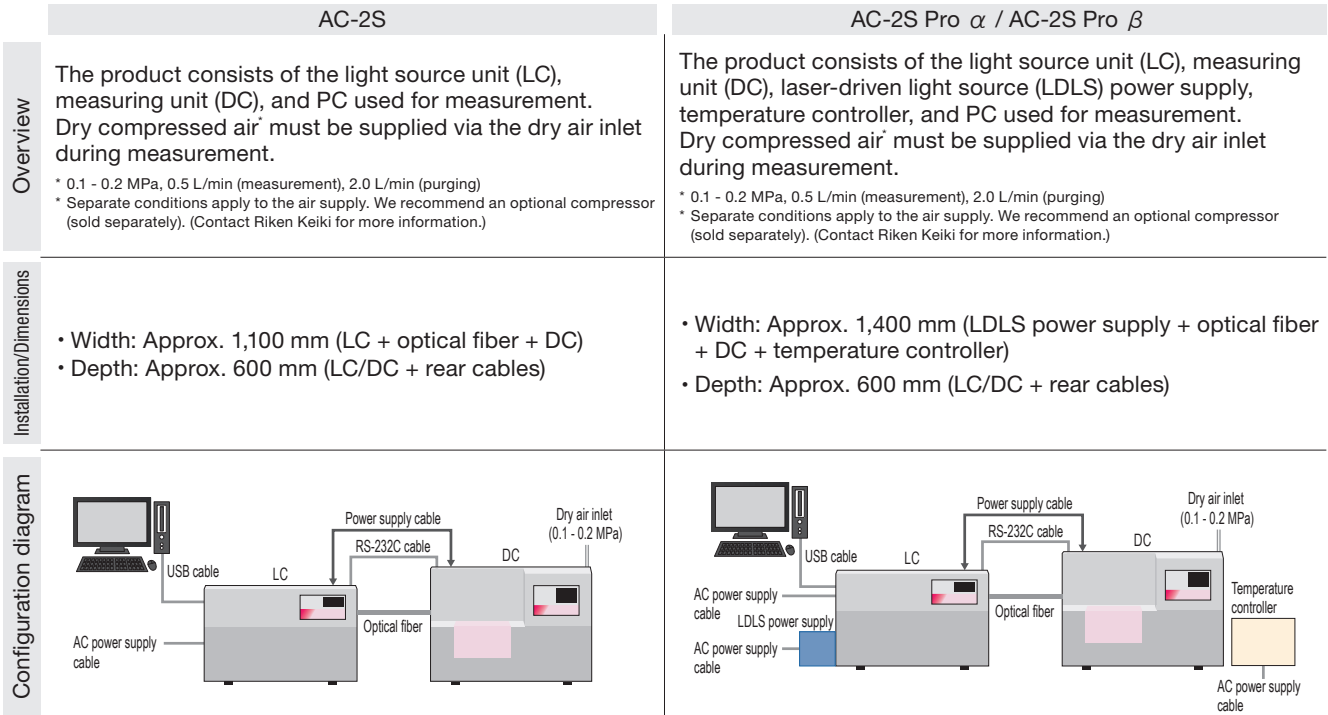
Function availability table

Function	AC-2S	AC-2S Pro α	AC-2S Pro β
Multi-point measurement	●	●	●
Repeated measurement	●	●	●
High-temperature measurement	—	●	●
Film thickness measurement	—	●	●
Long-life light source	—	●	●
Low-energy measurement	—	●	—
High UV intensity measurement	—	●	—
Micro spot measurement	—	—	●
Consumable part replacement notification	●	●	●

Exterior drawings



Product configuration



Explanation of AC-2S Pro Functions

Common for both AC-2S Pro α / AC-2S Pro β

■ High-temperature measurement

(Visualizing temperature-induced changes in measurement samples)

Measurement examples:

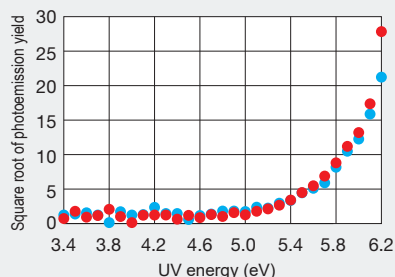
Catalysts, organic light-emitting diode functional materials, organic solar cell functional materials, fuel cell electrode catalysts, all-solid battery electrodes, etc.

Example measurements at room temperature and high temperature

- Room temperature (23.8 °C)
- High temperature (100 °C)

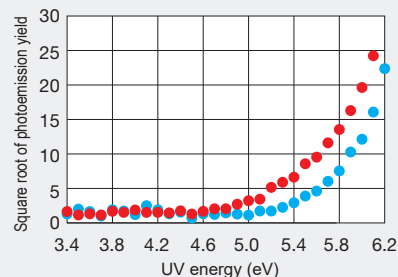
Previous model: Room temperature only

Sample 1: Substance for which measurement results remain unchanged even when temperatures change



Can be set up to 100 °C

Sample 2: Substance for which measurement results change when temperatures change



■ Film thickness measurement

Measurement examples:

Component surface coating thickness measurement, etc.

Previous model: Measurement not possible if photoemission is low

Compatible even with materials with low photoemission

■ Long-life light source

Uses laser-driven light source (LDLS)

Previous model: Service life approx. 1,500 hours

Service life approx. 10,000 hours

AC-2S Pro α

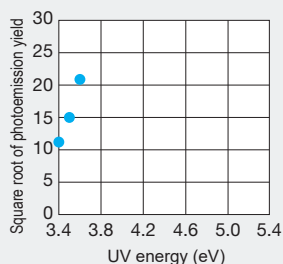
■ Low-energy capability

Measurement examples:

Organic light-emitting diode anode materials, organic solar cell anode materials

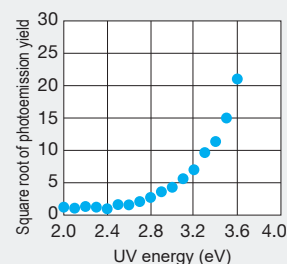
Measurement example using low-energy capability
Example measurement sample: Organic light-emitting diode anode material

Previous model: Down to 3.4 eV (Measurement not possible with anode materials below 3.4 eV)



Sufficient measurement data cannot be obtained due to inability to measure below 3.4 eV.

Capable of measuring from 2.0 eV (anode measurement possible)



Measurements can be obtained due to low-energy capability down to 2.0 eV.

■ High UV intensity capability

Measurement examples:

Research on charging characteristics of toner and other substances, surface concentration measurements of additives, etc.

Previous model: 500 nW

UV intensity: above 2500 nW

AC-2S Pro β

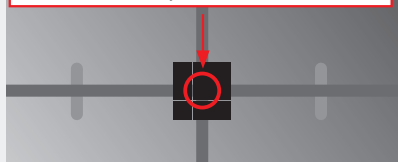
■ Micro spot measurement

Measurement examples:

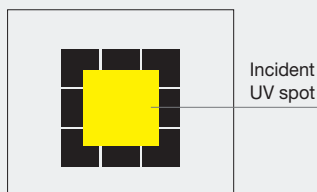
Measurement of contamination/oxidation of electrodes and minute electrical components on PCBs, etc.

Example of measurement using micro spot measurement capability
(Example of measurement of area of interest consisting of nine 1 mm square objects in a row)

Need to measure only one of nine areas of interest

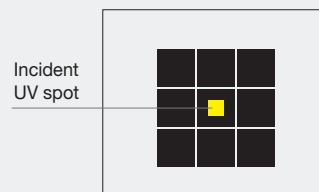


Previous model: 4 mm × 4 mm



Area of interest cannot be measured because the irradiation spot is too large.

0.4 mm × 0.4 mm



Micro spot (0.4 mm × 0.4 mm square) enables measurement of just the area of interest.

AC-2S Series specifications

Model	AC-2S	AC-2S Pro α	AC-2S Pro β
Measuring principle	Photoemission yield spectroscopy in air (PYSA) (Detector: Low-energy electron count method)		
Measurement energy scanning range	3.4 - 6.2 eV (364 - 200 nm)	2.0 - 6.2 eV (620 - 200 nm)	3.4 - 6.2 eV (364 - 200 nm)
Repeatability (standard deviation)	Work function 0.02 eV (sample: Au plate)		
Measurement time	Standard time required for work function measurement: Approx. 5 minutes* * For measurement energy scanning range: 4.2 - 6.2 eV, step: 0.1 eV, count time: 5 s per step		
Maximum count rate (CPS: Electron count per second)	4,000 cps		
UV lamp	Deuterium (D ₂) lamp	Laser-driven light source (LDLS)	
Minimum light intensity	Up to 1.0 nW (at 5.9 eV)	Up to 5.0 nW (at 5.9 eV)	Up to 1.0 nW (at 5.9 eV)
Maximum light intensity	500 nW or higher (at 5.9 eV)	2,500 nW or higher (at 5.9 eV)	200 nW or higher (at 5.9 eV)
UV spot size	Up to 4 × 4 mm ²	Up to 4 × 4 mm ²	Up to 0.4 × 0.4 mm ²
Spectrometer	Grating-type monochromator		
Sample size	50 mm×50 mm (max.), thickness 10 mm (max.)		
Sample stage size	115 mm × 122 mm	120 mm × 122 mm heated sample stage	120 mm × 122 mm heated sample stage
Multi-point measurement function	Up to 4 points (automatic measurement)		
Operating temperature/humidity range	15 °C - 35 °C (no sudden changes), up to 60 % RH (no condensation)		
Power source	100 - 240 V AC, 50/60 Hz, 5 A (max.)	Main unit: 100 - 240 V AC, 50/60 Hz, 5 A (max.) LDLS (AC adapter): 100 - 240 V AC, 50/60 Hz, 2.5 A LDLS (main unit): 12 V DC, 120 W Temperature controller: 100 V AC (±10 %), 50/60 Hz, 1 A (max.)	
Dry compressed air supply conditions	0.1 - 0.2 MPa, 0.5 L/min (measurement), 2.0 L/min (purging)* * Separate conditions apply to the air supply. We recommend an optional compressor (sold separately). (Contact Riken Keiki for more information.)		
External dimensions	LC (light source unit): Approx. 480 (W) × 317 mm (H) × 450 mm (D) DC (measuring unit): Approx. 465 (W) × 360 mm (H) × 450 mm (D)	LC (light source unit)*: Approx. 623 (W) × 317 mm (H) × 450 mm (D) DC (measuring unit): Approx. 465 (W) × 360 mm (H) × 450 mm (D) Temperature controller: Approx. 200 (W) × 163 mm (H) × 150 mm (D) * The LDLS power supply is housed in the LC (light source unit).	
Weight	AC-2S LC (light source unit): Approx. 25 kg AC-2S DC (measuring unit): Approx. 31 kg	AC-2S LC (light source unit): Approx. 30 kg AC-2S DC (measuring unit): Approx. 31 kg Temperature controller: Approx. 5 kg	

Accessories

- Display
- PC
- Power supply cable (for LC)
- Power supply cable (LC-DC)
- Adapter plug
(3-pin → 2-pin + ground wire)
* AC-2S: ×1, Pro α/β : ×3
- USB interface cable (PC-LC)
- RS-232C interface cable (LC-DC)
- Detector
- Optical fiber
- Accessory sample set
- Tweezers
- Measurement/analysis/
data conversion software (CD- ROM)

Optional accessories

(sold separately)

- Compressor (with dry air generator)
- Tray for powder samples
(1.0 mm deep)
- Tray for powder samples (0.5 mm deep)
- Optical fiber protective acrylic cover
- Different diameter union joint
(for dry air)
- Detector (for replacement)
- Optical fiber (for AC-2S and Pro α)
- Optical fiber (for Pro β)
- D₂ lamp (for AC-2S)
- Ozone filter

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